WHAT NASA/RECON
CAN DO FOR YOU

A Computerized Information System
At Your Fingertips

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Scientific and Technical Information Division
Office of Technology Utilization
National Aeronautics and Space Administration
Washington, D.C.

WHAT IT IS

NASA/RECON, a computerized system that enables you to help yourself in a hurry to the specialized knowledge stored in NASA's huge collection of aerospace documents, is now at your service. Its electronic help in quickly retrieving technical information is available at many stations located in NASA centers throughout the country.

RECON's name is formed from the first syllables of two words that describe its chief distinguishing feature: REmote CONsole. The system has been described as information retrieval by a remote console. The console is remote from the store of information, a computer at the NASA Scientific and Technical Information Facility at College Park, Md., and yet in direct touch with it by leased phone lines. In some instances, console and computer are 3,000 miles apart.

A RECON station or terminal consists of a keyboard, a cathode-ray tube, and a teleprinter. You tell the computer what you want to find out by typing and pushing buttons on the keyboard; the computer replies by displaying its answers on the face of the cathode-ray tube; and the teleprinter writes down for you any answers you wish to keep. The three principal elements of a RECON terminal are closely grouped, like this:

When you use RECON, you communicate with a computer that contains complete, up-to-date bibliographic data about the hundreds of thousands of aerospace reports and journal articles that the NASA Office of Technology Utilization has collected, indexed, and stored. These scientific and technical documents range backward in date from those that have just entered the system to some that predate the start of the NASA collection, begun in 1962.

RECON is a real-time, on-line, time-shared information-retrieval service that—

1. Gives users thousands of miles apart equal and prompt access to the NASA central file of scientific and technical information.

2. Displays data regarding the contents of this big special information store in ways that help the user define precisely what he wants.

3. Guides each user, via Boolean logic, directly to the documents that are most likely to meet whatever requirements he specifies.

4. Facilitates active communication between former and present aerospace researchers; reduces dependence on luck, personal acquaintance, and fallible human memories in literature searches; and minimizes the possibility that a person will inadvertently duplicate a colleague's work.

The reports and journal articles that the NASA scientific and technical information program has collected record the significant findings of Government, industrial, and academic researchers throughout the world on matters of interest to the aerospace community. As such literature is acquired, it is summarized and extensively indexed in two abstract journals: *STAR* (*Scientific and Technical Aerospace Reports*) and *IAA* (*International Aerospace Abstracts*). By merely pushing buttons, a RECON user can obtain the title, date, author, accession number, contract number, and notation of content of any document described in those journals that is likely to be helpful to him. Printed or microfilm copies of most of these documents are available where RECON terminals have been installed, and can generally be consulted immediately; but if a particular item is not at hand, it can be ordered from the central files in Maryland.

Geographic, linguistic, and retrieval barriers to the use of recorded information have long handicapped workers in all scientific disciplines. RECON enables the participants in aerospace programs to surmount such obstacles with unprecedented ease and speed. It represents a major step toward more efficient dissemination and fuller employment of available information in many fields of knowledge.

HOW IT WORKS

Here is a closer view of a RECON keyboard:
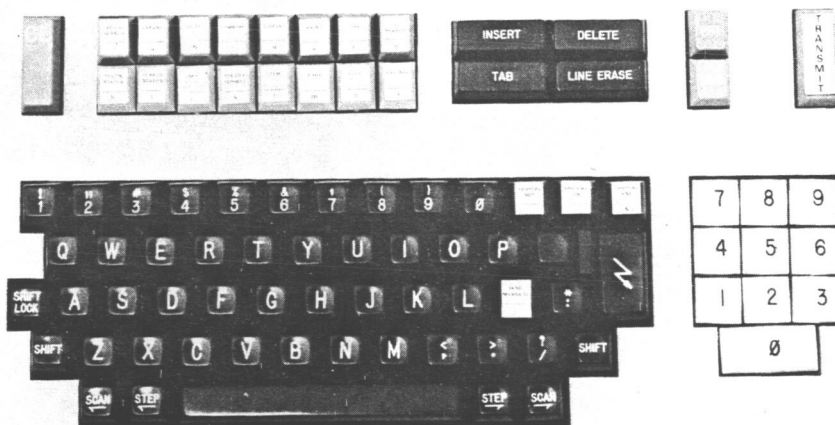
It is more elaborate than a typewriter keyboard, with keys in five different hues—orange, brown, white, dark blue, and light blue—but a large part of it is already familiar to anyone who has ever used a typewriter. Those dark (brown) ranks of keys at lower left, for instance—containing all the letters of the alphabet, with punctuation marks and symbols, shift keys, shift lock, and a spacing bar—are arranged just as they are on a standard typewriter, and are similarly used. To their right is a bank of numbered (white) keys like those on an adding machine, and beneath them a symbol, Ø, which means zero, not the letter O. These numbered keys are equivalent to the numbered brown keys, and need not concern most RECON users.

When you wish to type numbers on the RECON keyboard, you can use the top row of dark typewriter keys, as you would naturally expect to do. If you should want to type any of the punctuation marks and symbols arrayed above the numerals on those keys, you will need to depress the shift key.

The phrasing of your queries to the computer is important, for the computer "knows" only the indexing terms listed in the NASA *Thesaurus* and the older
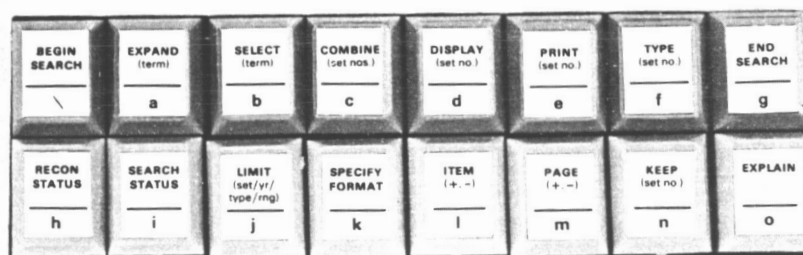
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Subject Authority List, both of which are available at every RECON terminal. This carefully chosen vocabulary includes thousands of terms widely used in the aerospace community, however, and they are terms that will be most likely to occur to you in the course of your search. If you come close but don't quite achieve the precise indexing term used for the subject you seek, RECON has simple ways of guiding you to it through displays of recognized terms on the cathode-ray screen, and you will learn them with practice.

Whatever message you type, though it will appear on the RECON screen, letter by letter, as you spell it out, will go nowhere until you press the large, rectangular (orange) button labeled TRANSMIT, at the upper-right corner of the keyboard. This means you can modify or erase (by typing over an error) until your message is exactly right. When you are ready, you push the TRANSMIT button. This causes your typed message to be flashed in a fraction of a second to the computer at College Park.

COMMAND KEYS

The keys and bars arrayed across the top portion of the RECON keyboard are command keys. All send direct commands to the computer. (You can ignore, however, the bars marked INSERT, DELETE, and LINE ERASE, which are for special nonretrieval uses of RECON.)

Of particular concern to you, as a newcomer to NASA/RECON, is the bank of 16 command keys placed immediately to the right of the (dark blue) rectangular vertical bar labeled CL, for "Clear," at upper left. Since their labels cannot easily be read in the keyboard photograph, they are reproduced separately below:

BEGIN SEARCH	EXPAND (term)	SELECT (term)	COMBINE (set nos.)	DISPLAY (set no.)	PRINT (set no.)	TYPE (set no.)	END SEARCH
\	a	b	c	d	e	f	g
RECON STATUS	SEARCH STATUS	LIMIT (set/yr/ type/rng)	SPECIFY FORMAT	ITEM (+,-)	PAGE (+,-)	KEEP (set no.)	EXPLAIN
h	i	j	k	l	m	n	o

These 16 keys (the top row colored dark blue, the bottom row light blue) control nearly every step of every literature search you will make with RECON. You will most frequently use the top row, the functions of which are explained here, beginning at left end:

BEGIN: Punch this, and the computer asks who you are, and what you want. In response, you type your name, a title for your search, and your mail code.

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These administrative data must be transmitted to the machine before it will start a search.

EXPAND: This one is used to ask the computer to display an alphabetized list of *Thesaurus* indexing terms that adjoin the terms you enter to describe the goal of your search. A second use of this key is to obtain further enlightenment about the indexing. Most principal indexing terms have Related Terms associated with them, and you can use the EXPAND key to get a look at these whenever you feel the need to do so.

SELECT: This key commands the computer to assign a "set number"—an identifying handle—to each indexing term you choose in the course of your search. Each set number will have a specific number of citations indexed to it.

COMBINE: You use this key to bring about both combinations and exclusions of sets in order to reduce the number of obtainable citations to a manageable total that you think will satisfy your needs.

DISPLAY: This key commands the computer to show you an actual citation of a report or journal article from the particular set you are investigating. The citation will be flashed onto the cathode-ray tube. You can use the DISPLAY key to look at as many citations as you wish.

PRINT: This key orders the computer to print out at the computer facility the complete record of your search and findings, which will be mailed to you.

TYPE: You use this key to command the teletypewriter to give you an immediate record of whatever citation is appearing on the cathode-ray tube at that time. Because the teleprinter is relatively slow, and because you don't wish to tie up the console, you use the TYPE key only for the more urgent citations, and the PRINT key for anything of significant volume.

END: You press this when you have completed your RECON search. It signals the computer to ask you to type your opinion of RECON's effectiveness, for system-improvement purposes, and when you have done so, it clears your station for the next user.

The bottom row of keys in the command group has the following functions, beginning at left end:

RECON STATUS: You use this to find out when a particular file was most recently updated, or the number of citations in a file, or the number of RECON terminals in operation, etc.

SEARCH STATUS: This key enables you to review the steps you have taken so far in your search, by asking the computer to display the various commands given and the results of each.

LIMIT: You use this key to narrow the list of citations requested to a particular file or to specific ranges of dates or accession numbers.

SPECIFY FORMAT: This key enables you to specify the number of data elements you wish to see in the various citations you are requesting.

ITEM + −: This key commands a step forward or backward in the set of citations being displayed to you as the result of a DISPLAY command.

PAGE + −: Using this key is equivalent to turning a page forward or backward to find out more about a displayed list or citation.

KEEP: Using this key identifies the citation displayed on the cathode-ray tube as one that you would like to keep in a special set for further use.

EXPLAIN: The principal purpose of this key is to call up a display briefly explaining to a newcomer how RECON works. The secondary use of the key is to enlighten him when, receiving an error message, he doesn't know what he has done wrong or how to remedy his error. The EXPLAIN key enables the computer to guide him to the right procedure.

You will note that under the label BEGIN there is a symbol, " ` ", and under each other label in this bank of command keys appears a lowercase letter of the alphabet. These are the computer-language equivalents of the labels above them; the symbols appear on the screen whenever the command keys are used.

A LOOK AT NASA/RECON AT WORK

This booklet provides a brief introduction to NASA/RECON; for a full-dress briefing, you must turn to the User's Manual. Information specialists familiar with RECON are present wherever a console is located, and they will coach beginners with the system. A simple search given below describes the basic approach and reveals the kinds of displays you may expect to see on the cathode-ray tube when you begin your own literature searches with the computer's help.

Your first move after seating yourself at a RECON console is to touch the key labeled BEGIN, and push the TRANSMIT button. When you do so, the following display appears. You type in the required answers, pressing the TRANSMIT key after each one. This sequence causes the next display to appear:

```
PLEASE ENTER THE FOLLOWING INFORMATION PRESS XXXXX FOLLOWING EACH ENTRY

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -


SEARCH TITLEpABC




NAME OF PERSON CONDUCTING SEARCHpEFG

NAME OF PERSON RECEIVING RESULTS (IF        DIFFERENT)p HIJ

THE FOLLOWING FILES ARE AVAILABLE FOR     YOU TO SEARCH

    1 --STAR. 1AA

    2 --

    3 --

ENTER NUMBER OF DESIRED FILEp ■
```

Type the number of the file you wish to search, and press TRANSMIT again. The search can now begin. Each group of documents indexed to a term will have an identifying number called a set. Adjoining will be the number of documents in that set. Adjoining will be the term or combination that produced it. Combining functions are $+ = $ OR, $\$ = $ AND, $ - = $ NOT.

Your next move will be to touch the EXPAND key, type your principal search subject on the keyboard, and press TRANSMIT. Let's suppose your subject is AIR POLLUTION DETECTION. The computer will then display an alphabetized list of indexing terms adjoining your subject:

EXPAND AIR POLLUTION DETECTION	REF	DESCRIPTOR			TP	CIT	RT

REF	DESCRIPTOR	TP	CIT	RT	REF	DESCRIPTOR	TP	CIT	RT
					E10	AIR TO AIR	1	51	
E01	AIR LOCKS	3	24		E11	AIR TO AIR MISSILE	1	30	
E02	AIR MASS	1	33		E12	AIR TO AIR MISSILES	3	42	6
E03	AIR MASSES	3	89		E13	AIR TO AIR REFUELING	2	10	
E04	AIR NAVIGATION	2	324	1	E14	AIR TO SURFACE	1	83	
E05	AIR POLLUTION	2	360		E15	AIR TO SURFACE MISSILE	1	42	
E06	AIR POLLUTION DETECTION				E16	AIR TO SURFACE MISSILES	3	40	
E07	AIR PURIFICATION	2	95		E17	AIR TRAFFIC	2	133	
E08	AIR SAMPLING	2	161		E18	AIR TRAFFIC CONTROL	2	878	1
E09	AIR SPEED	1	52		E19	AIR TRANSPORTATION	2	360	

ENTERp ■   -MORE-

It is now evident that whereas AIR POLLUTION DETECTION is not a recognized indexing term, AIR POLLUTION is. You see that it has a reference number at left and, at right, a summary of citations—360 at this writing—that are indexed to that term in the NASA Scientific and Technical Information System. You then choose this term by using the SELECT command and the reference number E$\emptyset$7. This produces set 1. Even though 360 citations seem unwieldy for your purposes, you decide to sample the group by commanding the computer to DISPLAY the appropriate set number. Therefore, you press DISPLAY, type the number 1, and then press TRANSMIT. At once, the computer displays a complete citation from this group:

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This is clearly not what you are looking for, so you decide to use the other part of your search title and try your luck with that. You touch the EXPAND key, type "DETECTION," and push TRANSMIT. Back comes a display of alphabetized terms that surround DETECTION:

You SELECT E06, the reference number for DETECTION, which produces set 2. You discover that this set has 4787 citations; clearly you are going to have to narrow your search.

The next step, then, is to ask the computer how many citations in the information system contain *both* AIR POLLUTION and DETECTION as indexing terms. To find this out, you press the COMBINE key and type "1$2," which means "Combine Sets 1 and 2." This time, you are pleased to receive the computer's answer that there are only five items in this new set, which is numbered 3.

The next step is to ask the computer to DISPLAY set 3.

When the computer displays the complete citations to you, it is at once apparent that two of the five are highly pertinent to your search. Since you want to take the citations to your library to get copies of them, you push the key labeled TYPE, and the teleprinter provides you with this permanent record of your search.

```
        PRINT 05/2/1-2          TERMINAL=07
    68A81393 ISSUE 53 CATEGORY 04 00/10/67 UNCLASSIF
    IED REPORT
        GAS CHROMATOGRAPHIC DETERMINATION OF LEAD TETRAE
    THYL IN THE ATMOSPHERE LA DETERMINAZIONE GAS CROM
    ATOGRAFICA DEL PIOMBO TETRAETILE NELL'ATMOSFERA.
    (DETERMINATION OF TETRAETHYL LEAD IN ATMOSPHERE BY
    GAS CHROMATOGRAPHY)
        PERIN, G.
        INIT· IN MEDICINA DEL LAVORO, VOL. 58, OCT. 4119
    67, P. 624-631. COLL· 15 REFS. LANG· IN ITALIAN.
    /AIR POLLUTION/AIR SAMPLING/CONCENTRATION (CO
    MPOSITION)/*DETECTION/DOSAGE/GAS ANALYSIS/*GAS C
    HROMATOGRAPHY/*LEAD COMPOUNDS

    67A11037 ISSUE 01 CATEGORY 11 00/10/66 UNCLASSIF
    IED REPORT
        HOW AIR POLLUTION CONTROL INSTRUMENTATION DEVELO
    PED FOR THE AEROSPACE INDUSTRY COULD BENEFIT THE U
    RBAN SOCIETY. (AIR MONITORING INSTRUMENTS USED IN
    DETECTION AND CONTROL OF AIR POLLUTION)
        MCKELVEY, J. W.
        INSTRUMENT SOCIETY OF AMERICA, ANNUAL CONFERENCE
    AND EXHIBIT, 21ST, NEW YORK, N.Y., OCT. 24-27, 19
    66, PREPRINT. 8 P. MEMBERS, 0.75, NONMEMBERS, 1.0
    0.
        /AIR/*AIR POLLUTION/CONFERENCE/CONTROL*CONTR
    OL SYSTEM/DETECTION/EVALUATION/INSTRUMENT/*INST
    RUMENTATION/*MONITOR/OPERATION/POLLUTION/SYSTEM
```

If a large number of citations are applicable, rather than tie up the computer you would push PRINT which orders the computer to print out later the record of your search which will then be mailed to you with the accompanying information.

```
        SEARCH TITLE AIR POLLUTION DETECTION
        DATE/FILE      2-3-70/1
        SEARCH BY      COLES, V. L.
        REQUESTOR      VOLTA TORREY
        ADDRESS        USS


TERMINAL 07  2-3-70
        TOTAL TIME PER COMMAND FOR THIS USER
    RECON       TIME            RECON          TIME              RECON        TIME
    COMMAND     MIN    NO       COMMAND        MIN     NO        COMMAND       MIN    NO
    BEGIN SEARCH 003.12  1      COMBINE        000.08   1        PRINT        000.07   1
    EXPAND      000.00   0      LIMIT          000.18   2        LIMIT ALL    000.00   0
    DISPLAY     000.00   0      KEEP           000.00   0        END SEARCH   003.04   1
    SELECT      000.23   2      TYPE           000.00   0        ERROR        000.00   0
    DISPLAY SET 000.00   0      MESSAGE        000.00   0        ITEMS PRINTED        2

        Q1=1    Q2=    Q3=2    Q4=1    Q5=1
        TOTAL ELAPSED TIME IS 011.44 MIN.

        GENERAL COMMENTS (IF ANY) 2

        SET NO. DESCRIPTION
        1       360 AIR POLLUTION
        2       4787 DETECTION
        3         5 1*2
```

The entire search, you find, has consumed only 11.44 minutes of your time, for on the printout the computer not only tells you how long the search took but exactly which steps were taken and in what order. When your search has been completed, a series of questions will appear on the screen. Each one should be answered as they are useful in evaluating the effectiveness of . RECON.

```
TOTAL ELAPSED TIME IS 11.44 MIN                    S

        1 - HIGHLY                            2 - MODERATELY

        3 - NO OPINION                        4 - DEFICIENT

ARE RETRIEVED ITEMS RELEVANTp1

ARE THE RESULTS EXHAUSTIVEp

ARE THE RESULTS WORTH THE TIME SPENTp

WERE YOU INSTRUCTED IN USE OF RECONp

IS THE MANUAL USEFULp

GENERAL COMMENTS (IF ANY)p

ENTERp ■
```

Very few NASA/RECON searches are as simple as this example, but with practice you will soon find that more complicated searches will become easy and swift. Many other search strategies are at your disposal. Instead of homing in only by subject, you can build your search around the name of the author, or the corporate source or institution where work was done, or by contract or accession numbers, or by some combination of inclusion and exclusion of these elements that will help you zero in on your target.

WHERE IT IS

NASA/RECON went into service on an experimental basis in February 1969, with consoles located at Langley Research Center, Electronics Research Center, and Lewis Research Center, as well as in NASA Headquarters and the Scientific and Technical Information Facility. RECON has since been extended to include all NASA centers and encompass many additional consoles.

All NASA/RECON consoles are linked by leased telephone lines to an IBM 360/50 computer in the NASA Facility at College Park. The users at the remote consoles are usually sharing the resources of the computer simultaneously, and so swift is its response that all receive their answers without appreciable delay. This same computer does all the current processing and retrieval of technical information for the agency.

WHY IT EXISTS

A NASA scientist or engineer normally uses the agency's information system for one of two main reasons: (1) to find out the latest results of work being done by fellow researchers in his field who are employed on the same or a similar project; and (2) to obtain a detailed historical review, especially when embarking on a new assignment, of what has been accomplished to date in a particular field. In either case, the seeker for information needs fast, timely, and highly specific results.

Formerly, he sought those results by first trying to explain to a librarian, in the terms of his own discipline (often unfamiliar to the librarian), what he was looking for. The librarian then endeavored to translate his request into appropriate indexing terms used in computer coding at the Scientific and Technical Information Facility. The request was mailed to the Facility, and as soon as possible was processed along with various other requests for infor-

mation searches. When the computer had completed the search, the result was mailed to the requester, who often found himself confronted with a very large batch of report citations, not always pertinent to his needs, which arrived well after he had asked for them. The response time was inadequate and the results were not dependably precise.

Recognizing the inadequacy of this mail-order search method, NASA has developed several different streamlining procedures, including SDI (Selective Dissemination of Information) and SCAN (Selected Current Aerospace Notices), in a continuing effort to speed up and refine information dissemination and retrieval. Although these were decided improvements, it became obvious that the very best way to achieve speed, precision, and timeliness in retrieving information stored in the computer would be to put the scientist or engineer seeking the information in direct contact with the computer.

NASA/RECON, the result of extensive development and experimentation, is the realization of that aim. The man at the remote console now conducts his own search by means of a dialog with the computer, which helps him pinpoint the object of the search.

At present, NASA/RECON gives its users immediate access to the very large collection of aerospace documents that have been announced in the semimonthly journals *STAR* and *IAA,* as well as in the periodic issues of *Classified STAR* and *Aerospace Medicine and Biology.* It does not store or transmit classified information, because its communication lines are not secure, but it does provide sufficient references to this kind of information to enable the user to go to his NASA library and, having established his security clearance, obtain the classified reports there.

NASA/RECON's potential is broad. The system is capable, limited only by its storage capacity and the availability of computer time, of handling multiple collections of information, each with its own unique vocabulary, data elements, and descriptions.

At present, RECON's terminals are all in fixed locations and connected to the computer by permanent leased telephone lines. There are two other types of terminals in being but not yet in regular operation. One of these is a dial-up connection, where the remote console is linked to the computer only when the person who wants it dials a special number that calls the computer.

Another novel arrangement employs a completely portable console. It can be used wherever there is a telephone, with an acoustic coupler forming the link between the telephone handset and the console. This type of RECON terminal has a low rate of transmission, and therefore is practical only where the volume of searches is small. It does, however, provide almost complete mobility.